

EXHIBIT 20



THE ECONOMIC EFFECTS OF ADMINISTRATIVE ACTION ON IMMIGRATION

November 2014



Contents

Executive Summary.....	2
I. The Economic Effects of Administrative Action on Immigration.....	3
Effects on Population and the Labor Force.....	4
Effects on Output per Worker	5
Effects on Total Output.....	6
II. Effects on U.S.-Born Worker Employment and Wages.....	9
Employment Effects	9
Wage Effects	9
III. Effects of Higher Growth on the Federal Budget.....	12
Appendix: Detailed Methodology for GDP and Wage Estimates	13
Population.....	13
Labor Force	16
Output per Worker	17
U.S.-Born Worker Wages	20
References	23

Executive Summary

This analysis examines the economic impact of the administrative actions on immigration announced by President Obama on November 20th, 2014. The analysis is based on the economic literature, including, wherever possible, the methods and studies that the Congressional Budget Office (CBO) employed in its analysis of the Border Security, Economic Opportunity, and Immigration Modernization Act (S. 744) passed by the Senate in June 2013.

CEA's analysis includes a range of estimates. The conservative lower bound of these estimates indicates that these administrative actions will:

- Raise the level of U.S. GDP by 0.4 percent after ten years, equivalent to an additional \$90 billion in real GDP in 2024 (in today's dollars). This would be the result of:
 - An expansion in the size of the American labor force by nearly 150,000 workers over the next ten years, largely as a result of higher labor force participation; and
 - An increase in the productivity of American workers, both because of increased labor market flexibility and reduced uncertainty for workers currently in the United States and because of increased innovation from high-skilled workers.
- Have no impact on the likelihood of employment for U.S.-born workers.
- Raise average wages for U.S.-born workers by 0.3 percent in 2024, or \$170 (in today's dollars).
- Cut Federal deficits by \$25 billion in 2024 due to the addition to real GDP growth over the next ten years—although the actual budgetary effects of the actions could vary.

CEA's plausible upper-bound projection, based on the more optimistic estimates in the economic literature, is that the actions would raise the level of U.S. GDP by 0.9 percent after ten years, equivalent to \$210 billion in GDP in 2024 resulting in a \$60 billion reduction in the deficit after a decade.

These estimated effects are significant but are a fraction of the economic benefits that would occur if these actions were superseded by Congressional action on commonsense immigration reform. CBO estimated that S. 744 would increase real GDP by 3.3 percent, or roughly \$700 billion, in ten years and 5.4 percent, or about \$1.4 trillion, in twenty years (CBO 2013b).

Note that all estimates of immigration policy changes on the economy are complex and difficult, especially in the long run (see, for example, the discussion in CBO 2013b). CEA's estimates rely on a number of assumptions that are spelled out in detail in the Appendix and reflect a range of more conservative to less conservative scenarios.

I. The Economic Effects of Administrative Action on Immigration

CEA's estimates of the economic impact of administrative action on immigration are based on the following set of actions included in the President's announcement:

- **Providing deferred action to low-priority individuals with significant family ties.** The Department of Homeland Security (DHS) will expand the existing Deferred Action for Childhood Arrivals program (DACA) which allows young people who came to the country before turning 16 years old who meet certain education guidelines, such as graduating from high school or attending college, to request temporary relief from removal ("deferred action") and be eligible to obtain work authorization. DHS will also establish a similar process for parents of U.S. citizens or Lawful Permanent Residents (LPRs) who have been in the country for five years or more to request deferred action;
- **Expanding immigration options for foreign entrepreneurs who have created American jobs or attracted significant investments.** DHS will expand immigration options for foreign entrepreneurs who meet certain criteria to obtain either temporary status or LPR status if they are able to meet certain requirements such as creating jobs, attracting investment, and generating revenue in the United States;
- **Extending on-the-job training for science, technology, engineering, and mathematics (STEM) graduates of U.S. universities through reforms to the existing Optional Practical Training (OPT) program.** DHS will propose changes to expand and extend the OPT program and require stronger ties between OPT students and their colleges and universities following graduation;
- **Providing work authorization to spouses of individuals with H-1B status who are on the path to LPR status.** DHS is finalizing new rules to give H-4 dependent spouses of H-1B workers access to work authorization as long as their H-1B spouse has an approved green card application; and
- **Providing portable work authorization for high-skilled workers awaiting processing of LPR applications.** Under the current system, employees with approved LPR applications often wait many years for an immigrant visa to become available. DHS will make regulatory changes to allow these workers to move or change jobs more easily.

Our calculations of the economic effects of these actions are based on estimates of the size of the eligible population for each action provided by DHS and by the Office of Management and Budget (OMB).

To estimate the effects of these policies, we begin with the following identity, which breaks up output (GDP) into several components:

$$GDP = Population * \frac{Labor\ Force}{Population} * \frac{Employment}{Labor\ Force} * \frac{GDP}{Employment}$$

It is important to note that this identity reflects long-run aggregate *supply*, while the level of total output in both the short and long run is determined by the interaction of aggregate supply and aggregate demand. However, because CEA's estimates focus on the long-run impact of these administrative actions, we assume, as is standard, that in the long run aggregate demand will match aggregate supply; in other words, we assume that, in the long run, the economy is not constrained by aggregate demand.

Alternatively, to calculate long-run *changes* in GDP, the above identity can be rewritten as:

$$\% \Delta GDP = \% \Delta POP + \% \Delta LFPR + \% \Delta EMPR + \% \Delta \frac{Output}{Worker}$$

where *POP* is the working-age population, *LFPR* is the labor force participation rate, and *EMPR* is the employment rate. Changes in immigration policy, generally speaking, are likely to have the strongest impacts on population, the labor force participation rate, and output per worker. We assume that immigration policy does not impact the employment (or unemployment) rate in the long run.

To assess long-run changes in GDP associated with administrative action on immigration, CEA thus estimated the sum of changes, relative to current policy, in each of the following components: (a) the size of the working-age population; (b) the labor force participation rate; and (c) output per worker. For each component, CEA calculated both an upper- and lower-bound estimate based on ranges of parameters found in the academic literature. CEA's estimates rely on a number of assumptions that may be only approximately valid. Consequently, the true economic impact of administrative action may ultimately be greater or less than CEA's estimates. In this analysis, to be conservative we highlight the lower-bound estimate. For detailed explanations on the methodology behind and assumptions underlying each component of our GDP calculations, see the Appendix.

Effects on Population and the Labor Force

Compared to current administrative policy, relatively few new immigrants (with some small exceptions) will be allowed into the United States under the administrative actions considered in CEA's estimates. Thus, these actions' effects on the size of the U.S. labor force will not be due to large expansions in the working-age population.¹ Instead, CEA estimates that these actions will affect the size of the labor force by increasing the labor force participation of people who would

¹ This contrasts with S. 744, which according to CBO would increase the size of the U.S. working-age population by 10.4 million in 2023, or 3.0 percent, relative to current law (CBO 2013a).

have been U.S. residents even in the absence of administrative action, primarily through providing work authorization for dependent spouses of H-1B nonimmigrant visa holders, also known as H-4 dependents (see Table 1). Based on academic studies of previous policy reforms that reduced uncertainty for undocumented immigrants, such as the 1986 Immigration Reform and Control Act (IRCA), CEA estimates that deferred action will not cause significant changes to the labor force participation of undocumented immigrants. Nevertheless, our upper-bound estimate incorporates the finding in Pan (2012) of a small increase in female labor force participation following the implementation of IRCA.

Table 1: Estimated Changes to the U.S. Labor Force in 2024²

	Lower-Bound Estimate	Upper-Bound Estimate
Administrative action		
Expanding options for foreign entrepreneurs	+33,000	+53,000
Extending OPT for STEM graduates	+10,000	+36,000
Work authorization for dependent spouses of H-1B visa holders with approved LPR applications	+104,000	+167,000
Portable work authorization for certain high-skilled workers	0	0
Deferred action for low-priority individuals	0	+42,000
Total	+147,000	+297,000

Taken together, CEA conservatively estimates that administrative action on immigration will increase the size of the U.S. labor force in 2024 by approximately 147,000 workers, or 0.1 percent, relative to current administrative policy.

Effects on Output per Worker

CEA estimates that the largest impact of administrative action on output will come in the form of increases in output per worker—or, in other words, increases in productivity. Output per worker is a combination of several factors: (a) total factor productivity (the amount of output for a given capital and labor input); (b) hours supplied per worker; (c) the skill composition of the workforce; and (d) capital intensity.³

The administrative actions considered by CEA for this analysis are likely to lead to increases in productivity for several reasons. First, a large body of academic work has found that increases in high-skilled immigration lead to increases in productivity, both directly through increased innovation and indirectly through positive spillovers on nonimmigrant workers (Hunt and Gauthier-Loiselle 2010; Peri, Shih, and Sparber 2014). Such increases in total factor productivity would allow the U.S. economy to produce more for any given combination of capital and labor stock.

² In this table, as throughout this analysis, components may not sum to totals due to rounding.

³ Productivity is generally reported as output per hour and thus is not affected by additional hours of work. For presentational simplicity, we aggregate additional output per hour and additional hours into a concept that we refer to as “productivity,” defined as output per worker.

Second, the provision of work authorization to undocumented workers receiving deferred action is likely to increase the total productivity of the U.S. labor force by allowing for greater occupational mobility. As undocumented workers move to the legal economy, they will be able to work in occupations that better fit their particular level of skills, instead of working in occupations or industries where the likelihood of detection is lowest. Barcellos (2011), for example, finds that the 1986 IRCA, which provided work authorization for certain undocumented immigrants, led to increased occupational mobility, particularly for better-educated immigrants. In the wider academic literature, occupational reallocation and task specialization among both immigrant and native populations have been shown to be leading causes for increases in productivity associated with increases in low-skilled immigration (Peri and Sparber 2009). Because specialization allows for greater productivity among both immigrant and nonimmigrant workers, this pathway for increased output would also be likely to lead, in the long run, to increases in wages for all workers—immigrants and natives.

Finally, low-priority individuals eligible for deferred action, faced with less uncertainty about a future in the United States, may be more likely to make key investments in themselves and in their communities (Bratsberg et al. 2002). Once provided with certainty about their status, these individuals may be more likely to start a new business or to pursue additional education or vocational training, investments which they may not have made if they were unsure if they could remain in the United States and which may have spillovers even to nonimmigrants.⁴

CEA conservatively estimates that administrative action on immigration will increase output per worker by 0.3 percent in the long run. Of this increase, 0.2 percent is due to increases in productivity associated with actions focused on high-skilled immigrants, while 0.1 percent can be attributed to reduced uncertainty and increased occupational mobility associated with the expansion of deferred action for low-priority individuals. This is slightly less than half of the productivity effect that CBO estimated for S. 744.

Effects on Total Output

The combination of these estimated effects on the size of the labor force and on output per worker imply that, relative to current administrative policy, the announced administrative actions considered by CEA will increase output by a total of 0.4 percent in ten years. Using CBO's baseline projections for real GDP over the next ten years (CBO 2014c), this implies an increase of about \$90 billion in GDP in 2024. These estimates represent CEA's conservative lower-bound estimates of the impact of the announced actions on GDP. The upper- and lower-bound estimates are summarized in Table 2.

⁴ In addition to the potential that this increased certainty has on human capital investment, immigrants may be more likely to increase large-scale durables purchases, such as a new home. Furthermore, increases in income associated with increased productivity are expected to increase aggregate demand. Our estimates assume that any such short-run increase in aggregate demand due to reductions in uncertainty will ultimately be matched by aggregate supply in the long run.

Lower-Bound Estimate

CEA's lower-bound estimate for the impact of administrative action on immigration on long-run output is an increase of 0.4 percent relative to current administrative policy. Of this, 0.3 percent is attributable to administrative actions focused on encouraging high-skilled immigration, and 0.1 percent is attributable to deferred action for low-priority individuals.

The 0.3 percent increase in GDP associated with actions focused on high-skilled immigration can be decomposed as follows: 0.1 percent due to changes in the labor force and 0.2 percent due to changes in productivity. The 0.1 percent increase in GDP associated with deferred action is due entirely to changes in productivity.

Table 2: Summary of Estimated Changes in Real Output in Ten Years (Percent)

	Lower-Bound Estimate	Upper-Bound Estimate	CBO estimate of S. 744
Population: High-skilled immigration	+0.02	+0.05	+3.0
Population: Deferred action	0	0	
Labor Force: High-skilled immigration	+0.09	+0.16	+0.5
Labor Force: Deferred action	0	+0.03	
Output per Worker: High-skilled immigration	+0.15	+0.47	+0.7
Output per Worker: Deferred action	+0.14	+0.23	
Other (including changes in capital intensity)			-0.9
Total	+0.4	+0.9	+3.3
Change in Real GDP (\$billion)	+90	+210	+700

Note: In CEA's estimates, changes in capital intensity and other factors are incorporated into estimates of effects on output per worker.

Upper-Bound Estimate

CEA's upper-bound estimate for the impact of administrative action on immigration on long-run output is an increase of 0.9 percent relative to current administrative policy. Of this, 0.7 percent is attributable to administrative actions focused on encouraging high-skilled immigration, and 0.3 percent is attributable to deferred action for low-priority individuals (note that the components do not sum to the total because of rounding).

The 0.7 percent increase in GDP associated with actions focused on high-skilled immigration can be decomposed as follows: 0.1 percent due to changes in population, 0.2 percent due to changes in the labor force, and 0.5 percent due to changes in productivity. The 0.3 percent increase in GDP associated with deferred action is mostly due to changes in productivity (0.23 percent), but we also allow for increases in female labor force participation in this estimate (0.03 percent).

Comparison with S. 744

CBO's estimate for S. 744, which totaled 3.3 percent additional GDP after a decade (CBO 2013b), is substantially higher than our estimates for the announced administrative actions. The largest difference between the estimates of S. 744 and the administrative actions we analyze is that CBO

estimated that S. 744 would result in an additional 10.4 million people in the U.S. working-age population after ten years, equivalent to a 3.0 percent increase in population relative to current law. By contrast, our estimates imply at most a 0.1 percent increase in the population. In addition, CBO's estimated increase in the size of the labor force in ten years (0.5 percent) primarily reflects the increases in population resulting from S. 744, whereas CEA calculates that the announced administrative actions affect the size of the labor force mostly by increasing the labor force participation of people who would have been U.S. residents even in the absence of the actions. CBO also calculates larger increases in productivity as a result of S. 744 than CEA does in its lower-bound estimate for administrative action, principally due to their larger forecasts for population change.

II. Effects on U.S.-Born Worker Employment and Wages

In this section, we examine the effects of administrative action on immigration on the employment and wages of U.S.-born workers.

Employment Effects

Theory suggests that these policy changes would not have an effect on the long-run employment (or unemployment) rate, the focus of CEA's analysis, as the additional demand associated with the expanded economy would offset the additional supply of workers.

Consistent with the theory, much of the academic literature suggests that changes in immigration policy have no effect on the likelihood of employment for native workers. Card (1990), for example, examines the effect of a large influx of lower-skilled immigrants—the arrival of 125,000 Cuban immigrants in the 1980 Mariel boatlift, which increased the labor force in Miami by 7 percent—on the labor market opportunities of native workers nationwide. The author finds no effect on the likelihood of employment of lower-skilled, non-Cuban workers. Ottaviano and Peri (2012) and Peri and Sparber (2009) also report no evidence of crowding out of native employment by immigration. In a more recent paper, Peri, Shih, and Sparber (2014) find that increases in high-skilled immigration have no effect on the likelihood of unemployment for either college-educated or non-college-educated natives.

Consequently, we estimate that these actions will have no effect on the likelihood of employment of native workers in the long run.

Wage Effects

Although we hypothesize, based on theory and consistent with the academic evidence, that administrative action will have no long-run effect on the *quantity* of jobs held by native workers, our analysis of changes in output per worker implies that these actions will increase the *quality* of native-worker jobs and thus these workers' wages. As we discuss in Section I, academic research has found that increases in high-skilled immigration lead to both increases in innovation and positive spillovers on the productivity of native workers due to complementarities between their skills and those of immigrants (Hunt and Gauthier-Loiselle 2010; Peri, Shih, and Sparber 2014). Meanwhile, better task specialization and occupational reallocation as a result of work authorization for undocumented workers granted deferred action would allow for greater productivity—and thus higher wages—for native workers as well (Peri and Sparber 2009).

Empirical research has generally confirmed these effects.⁵ Card (1990) finds that within the Miami labor market, average wages for natives rose by 0.6 percent on the whole following the

⁵ Research by Borjas, Freeman, and Katz (1997) reports negative implications of immigration on the wages of the least-skilled U.S. workers. We note that their findings, based on a model calibration, do not match the empirical evidence from actual changes in immigration policy. Moreover, their model ignores considerations such as the

Mariel boatlift. Even the least-educated workers in Miami experienced small, positive wage gains post-Mariel. Peri, Shih, and Sparber (2014) find that increases in high-skilled immigration are associated with significant increases in wages for both college-educated native workers and non-college-educated (high school graduate) native workers.⁶

Parameters from the literature allow us to estimate wage gains for native workers separately for actions focused on encouraging high-skilled immigration and for deferred action for low-priority individuals. As with our GDP estimates, these wage estimates rely on a number of assumptions (see the Appendix for a full discussion of the methodology), so that the true increase in native workers' wages associated with administrative actions may ultimately be larger or smaller than our estimates.

High-Skilled Immigration

Based on parameters from Peri, Shih, and Sparber (2014), CEA calculates that administrative actions focused on encouraging high-skilled immigration would raise the real annual earnings of native college graduates by 0.4 percent by 2024, or about \$300 (in 2014 dollars). Native high-school graduates would see smaller, though still positive, wage gains from the administrative actions encouraging high-skilled immigration of 0.3 percent, or approximately \$110. Following Peri, Shih, and Sparber (2014), CEA estimates that administrative actions focused on encouraging high-skilled immigration will have essentially no impact on the wages of native workers who have not completed high school. Combining the impacts on college-educated workers, high-school graduate workers, and those workers with less than a high school degree, based on their shares in the population, we estimate that the administrative actions encouraging high-skilled immigration will increase native workers' wages by 0.3 percent, or approximately \$130 (in today's dollars).

Deferred Action

Using estimates from Chassamboulli and Peri (2014), CEA estimates that deferred action for low-priority individuals would increase the wages of all native workers by 0.1 percent on average by 2024. In today's dollars, this translates into an additional average wage gain for U.S.-born workers of \$40. The estimates in Chassamboulli and Peri (2014) do not permit a breakdown of the average wages effects by educational attainment.

Total Impact on U.S.-Born Worker Wages

Table 3 reports CEA's estimates for the increases in native worker wages based on the combination of the effects of the administrative actions on high-skilled immigration and on deferred action.

positive spillovers from the potential complementarity between immigrants and natives and the changes in capital and technology that more recent research have found to be important.

⁶ Friedberg (2001) and Hunt (1992) find broadly similar results in studies examining the effects of immigration on native-worker wages in other countries.

Table 3: Summary of Estimated Changes for Native Worker Wages (Percent)

Group and educational attainment	High-skilled immigration	Deferred action	Total
Native workers, less than high school	0	-	-
Native workers, high school	+0.27	-	-
Native workers, bachelor's or higher	+0.37	-	-
Total	+0.3	+0.1	+0.3
Change in 2024 annual earnings (2014 dollars)	\$130	\$40	\$170

Comparison with S. 744

CBO (2013b) projected that S. 744 would raise average wages for everyone, U.S.-born workers and immigrant workers, starting in 2025. Specifically, CBO estimated that when wage changes for native-born workers were averaged together with the new immigrants' wages, which are on average lower than native wages, the result would be a decrease in average wages in the United States by 0.1 percent after 10 years and an increase of 0.5 percent after 20 years. CBO emphasized that this did not imply that wages declined for native-born workers: "[These] figures represent differences between the averages for *all* U.S. residents under [S. 744]...and the averages under current law for people who would be residents in the absence of [S. 744]... [T]he additional people who would become residents under the law would earn lower wages, on average, than other residents, which would pull down the average wage." As a result, CBO's results are not directly comparable to CEA's estimates of the wage increases for native workers.

III. Effects of Higher Growth on the Federal Budget

In general, stronger economic growth reduces the deficit by both increasing revenues and reducing outlays (largely due to the interest savings from a lower path for the Federal debt). CEA uses standard analysis to estimate the impact that the *higher growth associated with the immigration administrative actions* would have on the budget. It is important to emphasize that this is not the same as a full budget scoring of the administrative actions.

For the purposes of this analysis, we assume that the growth effects of administrative action will be spread out evenly between 2015 and 2024 and use CBO's estimates of how economic growth will affect the Federal budget in 2024 (CBO 2014a). Using our conservative lower-bound estimate for the impact of administrative action on immigration on GDP, or 0.4 percent, CEA estimates that the additional growth in GDP caused by administrative action on immigration would reduce the Federal deficit in 2024 by \$25 billion. Our upper-bound estimate of 0.9 percent additional growth in GDP would yield a net deficit reduction of \$60 billion in 2024.

The actual budget effect would depend on other features of the administrative actions as well. For example, to the degree that the administrative actions increase tax compliance for undocumented workers, they would raise additional revenue above and beyond the impact they would have on measured GDP, since undocumented workers are already contributing to GDP. CEA's analysis focused solely on the economic impacts of immigration actions and the impact of the higher growth on the budget and did not systematically estimate these other factors that would feed into a full budget scoring of the immigration actions.

While the economic growth resulting from administrative action on immigration is estimated to reduce deficits, comprehensive immigration reform would have a larger impact on the U.S. fiscal outlook. CBO noted that estimated changes in productivity, wages, and investment from the Senate bill would likely reduce the deficit by an additional \$300 billion between 2024 and 2033 (CBO 2013b). This reduction due to economic growth would be in addition to the approximately \$850 billion in deficit reduction from 2014 to 2033 that CBO estimated in their full budget scoring of the bill's provisions (CBO 2013a).

Appendix: Detailed Methodology for GDP and Wage Estimates

In this Appendix, we offer further details on the methodology and assumptions underlying the GDP calculations summarized in Section I and the wage calculations summarized in Section II.

Recall our main framework for the changes in output associated with administrative action on immigration:

$$\% \Delta GDP = \% \Delta POP + \% \Delta LFPR + \% \Delta EMPR + \% \Delta \frac{Output}{Worker}$$

We characterize the changes in output associated with the announced administrative actions as changes in the working-age population, plus changes in the labor force participation rate, plus changes in the productivity of existing labor.⁷ Within this section, we analyze each of these components separately for administrative actions centered on high-skilled immigration and for deferred action for low-priority individuals, offering a lower-bound estimate and an upper-bound estimate of the effects for each set of actions. Table 4 provides a detailed list of the assumptions used by CEA in constructing each of these estimates.

Population

As noted above, compared to current administrative policy, relatively few additional immigrants will be allowed into the United States under the administrative actions considered in CEA's estimates, with some small exceptions. CEA thus estimates that the population changes associated with administrative actions will be very small. We estimate that the increase in the U.S. working-age population in 2024 due to immigration actions is between 0.02 percent and 0.05 percent, and these changes are entirely the result of actions focused on high-skilled immigration (expanded options for entrepreneurs and extended OPT for STEM graduates). Table 5 summarizes our estimates for changes in the working-age population in ten years.

High-Skilled Immigration

DHS estimates that approximately 10,000 individuals will obtain new entrepreneurial temporary status or an immigrant visa each year, for a total of 100,000 until 2024. Not all of these will be allocated to individuals outside of the United States, and over a ten-year period there is also likely to be some immigrant outflow. To account for these two factors, we consider typical emigration rates from the Census Bureau (2012) and mortality rates from the Centers for Disease Control (CDC 2010). We further assume a conservative range of displacement rates, that is, the share of visas issued that do not add to the population because they displace visas held by workers already in the United States. Together, CEA assumes combined outflow and displacement rates ranging between 20 and 50 percent. Our lower- and upper-bound calculations, therefore, suggest that the 100,000 individuals who obtain either a new entrepreneurial temporary status or immigrant visa over ten years will increase the U.S. population by between 50,000 and 80,000 in ten years.

⁷ Recall that we assume that the long-run employment rate will not change as a result of these immigration actions.

Table 4: Summary of Key Assumptions Used in CEA's GDP Estimates

	Lower- Bound Estimate	Upper- Bound Estimate	Source
<i>GDP</i>			
2014 GDP (in billions)	17,336	17,336	CBO (2014c)
2024 projected real GDP (in billions of 2014 dollars)	22,208	22,208	CBO (2014c)
<i>Population</i>			
2014 working-age population (in millions)	248	248	CBO (2014c)
2024 estimated working-age population (in millions)	274	274	CBO (2014c)
Immigrant outflow and displacement rate	0.50	0.20	Based on CDC (2010)/Census (2012)
Share working-age population in total population	0.78	0.78	CBO (2014c)/Census
Share of H-1B holders who are married*	0.73	0.73	DHS
Trend increase in STEM enrollment due to policy change	0	0.11	Based on Kato and Sparber (2013)
Share of STEM PhDs who would remain in United States	0.78	0.88	Based on NSCG
Share of STEM MAs who would remain in United States	0.46	0.52	Based on NSCG
<i>Labor Force</i>			
2014 labor force (in millions)	156	156	CBO (2014c)
2024 estimated labor force (in millions)	167	167	CBO (2014c)
2014 employment (in millions)	146	146	CBO (2014c)
2024 projected employment (in millions)	158	158	CBO (2014c)
Labor force participation rate, all foreign-born residents	0.66	0.66	BLS (2014)
Labor force participation rate, foreign-born females	0.55	0.55	BLS (2014)
Labor force participation rate, foreign-born males	0.79	0.79	BLS (2014)
Foreign-born population (in millions)	41	41	2013 ACS
Net annual immigration rate per 1,000 U.S. population	3.8	3.8	CBO (2014b)
Share of H-1B spouses with own H-1B work authorization*	0.23	0.23	DHS
Share of H-1B visa holders who are male*	0.76	0.76	DHS
<i>Output per Worker</i>			
Average annual wage, all U.S. workers (in dollars)	44,321	44,321	SSA (2013)
Average annual wage, undocumented workers (in dollars)	22,029	22,029	Oakford (2014)
Average annual wage, high-skilled immigrants (in dollars)	99,800	99,800	Based on NSCG
Share of undocumented immigrants who are female	-	0.44	Passel (2005)
Labor force participation rate, undocumented females	-	0.56	Passel (2005)
Labor force participation rate, advanced-degree holders	>0.95	>0.95	Based on NSCG

*Share for H-1B visa holders adjusting to LPR status. In its analysis, CEA assumes that these rates are the same for the population of all H-1B visa holders.

Table 5: Estimated Changes to the Working-Age Population in 2024

Administrative action	Lower-Bound Estimate	Upper-Bound Estimate
Expanding options for foreign entrepreneurs	+39,000	+62,000
Extending OPT for STEM graduates	+17,000	+62,000
Work authorization for dependent spouses of H-1B visa holders with approved LPR applications	0	0
Portable work authorization for certain high-skilled workers	0	0
Deferred action for low-priority individuals	0	0
Total	+56,000	+124,000

However, this number represents an increase in the total U.S. population, while our GDP identity requires information on the working-age population. We, therefore, scale the total population numbers by the 2014 working-age population share of total population of approximately 78 percent (calculated using data from CBO and Census), leaving a working-age population increase due to the 100,000 entrepreneurial visas of around 39,000 to 62,000.

The number of temporary students who graduate with U.S. master's and doctoral degrees who remain in the country to continue training in their course of study and who are likely to remain in the United States in 2024 under current policy is computed based on the staying rates in Tables 3 and 5 of Finn (2012) and linearly-projected degrees earned based on National Science Foundation (NSF) data. Some assumptions are made concerning the effect of the change in policy. Based on the National Survey of College Graduates (NSCG), the stay rates of master's graduates are computed to be 59 percent of those of doctoral graduates. Simulation of successive cohorts graduating provides an estimate of the additional number of STEM graduates in the U.S. in 2024 for our lower-bound estimate. Our upper-bound estimate also allows for increases in foreign enrollment in U.S. advanced-degree programs, as well as an increase in the likelihood that any given graduate will stay in the United States following graduation, in response to the change in policy. We use this information, in combination with typical marriage rates for high-skilled immigrants (73 percent) to reach our final estimates for increases in working-age population resulting from administrative action on STEM OPT extension of between 17,000 and 62,000.

The total estimated increase in working-age population due to new entrepreneurial visas and extension of STEM OPT is between 56,000 and 124,000 over ten years. CBO currently projects 2024 working-age population at 274 million, a 10.5 percent increase over the current 2014 working-age population of 248 million. CEA therefore estimates that this additional immigration would increase the working-age population of the United States in 2024 by between 0.02 percent and 0.05 percent relative to current administrative policy.

Deferred Action

Deferred action would change the status of individuals already in the United States. For this reason, we do not estimate changes in the U.S. working-age population associated with these actions.

Labor Force

Most of the administrative actions considered by CEA in its estimates will change the status of individuals already present and/or working in the United States. Therefore, we estimate changes in the size of the labor force to be relatively small, particularly in comparison to the effects of S. 744, the bipartisan Senate immigration reform bill (CBO 2013a). Our analysis estimates that increases in the U.S. labor force associated with administrative action on immigration are between 0.09 percent and 0.19 percent. Table 1 summarizes CEA's estimates of long-run changes in the size of the labor force.

High-Skilled Immigration

Though the changes in the labor force may be small, they are still positive, as new entrepreneurs obtaining a temporary or permanent status, extended stays for STEM graduates, and work authorization for H-4 dependents all have implications for the size of the labor force. We rely on several key assumptions in calculating the labor force implications of actions designed to encourage high-skilled immigration (see Table 4).

Of the 39,000 to 62,000 increase in working-age population resulting from the 100,000 new entrepreneurial temporary status or permanent visas over ten years, we calculate that approximately 86 percent will contribute to increases in the labor force. Under the new policy, spouses of these individuals will also be eligible for work authorization. Based on DHS estimates of the share of married high-skilled visa holders (73 percent), we decompose the increase in working-age population into entrepreneurs and their spouses. Although entrepreneurs will all be incorporated into the labor force, spouses may opt not to participate. We thus discount the increase in working-age spousal population by the BLS (2014) estimate for the foreign-born population's labor force participation rate of 66 percent. In total, our estimates imply an increase in the U.S. labor force due to the 100,000 new entrepreneurial visas of between 33,000 and 53,000 in ten years.

Following directly from the estimated increases in working-age population (excluding spouses), we note that labor force participation rates of STEM graduates are very high (above 95 percent), as calculated from the NSCG. Increases in the U.S. labor force due to STEM OPT extension are thus calculated to be between 10,000 and 36,000 in ten years.

DHS estimates that 124,600 H-4 dependent spouses are eligible for new work authorization under the new policy in the first year. An additional 35,900 are estimated to be eligible on an annual basis thereafter. The total increase in H-4 dependent visa work authorization over ten years is thus 447,700. Once again, applying our attrition and displacement rates suggests take-up of between 224,000 and 358,000 in ten years. Not all of these H-4 dependents require work

authorization from their principal visa holder spouses. In fact, DHS estimates that roughly 23 percent of H-1B spouses have their own visa work authorization, leaving between 172,000 and 276,000 spouses newly eligible for work authorization. Seventy-six percent of H-1B primary visa holders are male, according to DHS. Based on estimates from BLS (2014), their wives enter the labor force approximately 55 percent of the time. The male spouses of the remaining 24 percent of female primary visa holders enter the labor force at a rate of 79 percent (BLS 2014). Altogether, we estimate that over ten years offering work authorization to H-4 dependent visa holders will increase the labor force by between 104,000 and 167,000.

The total estimated increase in the U.S. labor force due to new entrepreneurial temporary status or permanent visas, extension of STEM OPT, and work authorization for H-4 dependents is between 147,000 and 255,000 over ten years. CBO currently projects that the U.S. labor force will be 167 million in 2024, a 7.1 percent increase over the current 2014 labor force of 156 million. The administrative actions encouraging high-skilled immigration would therefore increase the U.S. labor force in 2024 by between 0.09 percent and 0.16 percent relative to current administrative policy.

Deferred Action

Parallel to our discussion about population changes, deferred action for certain low-priority undocumented immigrants would provide temporary relief for millions of individuals. Based on the academic literature, CEA does not estimate large changes in the labor force as a result of this component of the new actions on immigration. In fact, research on the 1986 IRCA, which, among other measures, provided work authorization for many undocumented workers, found little evidence of significant changes in labor force participation or employment status. Therefore, in our lower-bound estimate, we assume no impact of deferred action on labor force participation. However, recent research by Pan (2012) suggests that the labor force participation of female undocumented immigrants covered by the 1986 IRCA increased by 4 percentage points following the law's implementation. We rely on this statistic for our upper-bound calculation of the impact of deferred action on the labor force participation of undocumented immigrants.

To calculate the increase in female labor force participation associated with deferred action, we assume application and approval rates consistent with DACA.⁸ A Pew Hispanic Center Report estimates that roughly 44 percent of the undocumented population are female (Passel 2005). Similarly, about 56 percent of female undocumented workers participate in the labor force. Relying on Pan's (2012) estimate, a 60 percent labor force participation rate increases the U.S. labor force by approximately 42,000 workers, or 0.03 percent.

Output per Worker

In contrast with the relatively small estimated effects of administrative action on immigration on changes in population and changes in the labor force, we estimate the announced actions to have the largest impacts on output per worker. For our analysis, we decompose output per worker

⁸ Importantly, though, this assumption may only be approximately valid, as the population of individuals potentially eligible for deferred action under these actions is different from those eligible under DACA.

into four components: (1) total factor productivity; (2) hours supplied per worker; (3) the skill composition of the labor force; and (4) capital intensity. CEA estimates that increases in output per worker associated with immigration actions are between 0.29 percent and 0.70 percent, or around 70 percent of the total estimated effect.

High-Skilled Immigration

A body of academic research conducted over the past ten years has found that high-skilled immigration has positive effects on innovation (as measured by patenting) and on total factor productivity. Due to increased flexibility in the overall labor market, wages may increase, which in turn may increase labor supply (or hours per worker). Finally, because the main changes in the labor force that we document are due to high-skilled labor, our estimates reflect increases in the skill intensity of work. If capital does not fully adjust to meet the larger labor force, we may see decreases in capital intensity.

We rely on estimates from Peri (2012) to consider the impact of immigration on output per worker. Across 10 regression specifications, Peri (2012) finds that immigration is positively associated with total factor productivity. We use the minimum (0.61) and the maximum (1.37) of these estimated elasticities in our lower and upper bounds (see Table 6 for details on the elasticities used). In other words, a one percent increase in the foreign-born employment share increases total factor productivity by between 0.61 percent and 1.37 percent. Our estimated increase in the foreign-born share of total employment in ten years due to administrative action encouraging high-skilled immigration ranges from 0.08 percent (in our lower-bound estimate) to 0.13 percent (in our upper-bound estimate).⁹ Therefore, increases in the foreign-born employment share resulting from administrative action on immigration translate into approximately a 0.05 percent to 0.18 percent increase in total factor productivity.¹⁰

⁹ We calculate the foreign-born employment share as follows: CBO (2014c) reports total employment of 146 million in 2014 and a forecasted 158 million in 2024. The 2013 American Community Survey reports that the foreign-born population was about 41 million. We estimate the foreign-born population in 2024 using CBO's net immigration rate of 3.8 per 1,000 in the U.S. population (see CBO 2014b). This corresponds to a net inflow of approximately 12 million foreign-born individuals by 2024, for a total of 54 million. As elsewhere in this analysis, we scale these total population numbers down to working-age population (78 percent) and then by the BLS (2014) estimate of the foreign-born labor force participation rate (66 percent). Taken together, the foreign-born employment share in 2014 is 14.6 percent and estimated to be 17.5 percent in 2024 in the absence of administrative action on immigration. The increase in the foreign-born labor force, as presented in Table 1, therefore increases the foreign-born employment share by between 0.08 percent and 0.13 percent, relative to current administrative policy.

¹⁰ To examine the robustness of this estimate, CEA also used an alternative methodology, based on research by Hunt and Gauthier-Loiselle (2010), to calculate the total factor productivity gains from high-skilled immigration. Both methods yield roughly similar results.

Table 6: Summary of Key Elasticities Used in CEA's Estimates

	Lower- Bound Estimate	Upper- Bound Estimate	Source
<i>Output per Worker</i>			
Total factor productivity	0.61	1.37	Peri (2012)
Hours per worker	0.09	0.61	Peri (2012)
Capital intensity	-0.22	0.27	Peri (2012)
Wage effects of 1986 IRCA	6.00	10.00	Kossoudji and Cobb-Clark (2002)

We follow the same logic to calculate increases in hours per worker associated with high-skilled immigration. Peri's (2012) estimates range from 0.09 to 0.61, suggesting that a one percent increase in the foreign-born employment share increases average hours worked by between 0.09 percent and 0.61 percent. Given the estimated increases in the foreign-born employment share due to administrative action, hours per worker are estimated to increase by between 0.01 percent and 0.08 percent.

As immigration is typically unskilled-labor intensive (i.e., most immigrants to the United States are lower-skilled than the average native worker), Peri (2012) finds that immigration is negatively associated with the skill intensity of the labor force. This is not the case with the current set of administrative actions, since, as Table 1 notes, the bulk of labor force increases are due to the administrative actions encouraging high-skilled immigration. For this reason, we take a different approach to understanding the impact of high-skilled immigration on the skill composition of the labor force. Our approach utilizes information on the average wage in the United States from the Social Security Administration (\$44,321 in 2012) and the average wage calculated from the NSCG for workers in STEM occupations who hold a visa (\$99,800 in 2010) to calculate the skill intensity of work based on wages.¹¹ We find a gain of between 0.11 percent and 0.17 percent, relative to current administrative policy.

Finally, though the effects are typically statistically insignificant, we also rely on Peri's (2012) work to consider that the capital stock may not fully adjust in response to the increase in labor. If this is the case, we may see a decrease in capital intensity with immigration. The estimated elasticities in Peri (2012) range from -0.22 to 0.27, suggesting that a one percent increase in the foreign-born employment share may decrease capital intensity by 0.22 percent or increase capital intensity by 0.27 percent. Again, these estimates are not statistically significant. Nevertheless, given the computed increase in the foreign-born employment share, we estimate changes in capital intensity ranging from -0.02 percent to 0.04 percent.

Summing these calculated effects offers an estimate of the total impact of high-skilled immigration on output per worker. Our lower estimate, which incorporates slowly adjusting capital, indicates that administrative action on immigration would increase output per worker by at least 0.15 percent, while our upper-bound estimate reaches 0.47 percent.

¹¹ In our upper-bound estimate, we also use average annual wage information calculated by Oakford (2014) for undocumented workers (\$22,029).

Deferred Action

Unlike the actions encouraging high-skilled immigration, there is no new immigration proposed as part of deferred action for low-priority undocumented immigrants. For this reason, we cannot use the estimated elasticities in Peri (2012) to calculate the impact of deferred action on output per worker. However, we know that alongside the productivity-enhancing benefits of high-skilled immigration, lower-skilled immigration allows workers to reallocate to better-matched and higher-paying positions. We also know that this job reallocation and task specialization has additional benefits for native workers in terms of increased productivity and wages (Peri and Sparber 2009).

We rely on work by Kossoudji and Cobb-Clark (2002) that documents an increase in wages for undocumented workers who were covered by the provisions of the 1986 IRCA. The authors report that workers gaining legal permanent status saw wage increases of 6 percent relative to a comparison group from the National Longitudinal Survey of Youth (NLSY). We use this estimate in our lower bound. It captures all of the components of output per worker in the worker's wage. For instance, research by Peri and Sparber (2009) finds increases in total factor productivity due to task specialization with low-skilled immigration. Barcellos (2011) documents significant occupational mobility for workers changing status under IRCA, which offers evidence that the task reallocation impact is not strictly from new immigration. Kossoudji and Cobb-Clark (2002) also report an additional 4 percent increase in wages due to observable characteristics of immigrants covered by the law. They note that this is consistent with increases in investment in human capital associated with reductions in uncertainty about legal status. We therefore consider a 10 percent increase in wages for the workers granted temporary relief through deferred action in our upper-bound estimates.

We calculate the total increase in output per worker associated with these wage gains based on a calculation in Oakford (2014) for the average wage for undocumented workers (\$22,029). When combined with the estimated wage gains from Kossoudji and Cobb-Clark (2002), this translates into a total increase in labor income for undocumented workers of between \$3.1 billion and \$5.2 billion. Over ten years, these labor income increases amount to between 0.14 percent and 0.23 percent of GDP.

U.S.-Born Worker Wages

The increase in productivity of the American workforce that we estimate in response to the announced actions on immigration has positive implications for wages for immigrants and native workers alike. In this section, we focus on the wage implications of administrative action on immigration for native workers alone. Given average annual earnings for all workers of \$44,321 and average annual earnings for foreign-born workers (both undocumented and legal immigrants) of \$43,864, this suggests that the average native worker earns higher wages than the average immigrant worker. In fact, we calculate an average annual wage of \$46,185 for native workers. Therefore, increases in native wages may in fact be greater, in dollar terms, than increases for all workers. As with our GDP calculations, we consider the impact on native wages

of the administrative actions encouraging high-skilled immigration and of deferred action separately.

Table 7: Summary of Estimates Used in Wage Calculations

Group	Mean annual earnings (2014)
Foreign-born workers	\$43,864
Native workers	\$46,185
Native college-educated workers	\$70,242
Native non-college-educated workers	\$33,689
Native high school graduates	\$35,209

Note: All estimates from 2014 Current Population Survey March supplement.

High-Skilled Immigration

Peri, Shih, and Sparber (2014) document an increase in native workers' wages in response to high-skilled immigration. Specifically, a one percentage point increase in the foreign-born STEM employment share increases the growth rate of college-educated native workers' wages by a lower-bound estimate of 5.6 percentage points. The authors also report increases in the growth of wages for native-born high school graduates of around 4.1 percentage points in response to foreign-born STEM immigration of one percentage point. Though the point estimates are positive, there is no statistically significant impact of high-skilled immigration on the wages of native high school dropouts.

Using our estimated actual increase in the foreign-born employment share (see footnote 9), we calculate an increase in native-born college-educated workers' wage growth over ten years of 0.43 percentage point and an increase in high school graduate workers' wage growth over ten years of 0.31 percentage points. Average wages for native-born college graduates and native-born high school graduates from the 2014 Current Population Survey (CPS) March supplement are \$70,242 and \$35,209, respectively. In combination with real wage growth projections for 2024 from CBO (2014c),¹² we calculate wage increases for native-born college graduates of around \$300 and wage increases for high school graduates of around \$110, relative to current administrative policy. This amounts to a 0.37 percent increase in wages for native college-graduates and a 0.27 percent increase in wages for high school graduates over the ten-year period.

Deferred Action

As we have previously mentioned, the increased flexibility in the labor market resulting from the President's actions on immigration will allow all workers to specialize in the jobs best suited for their abilities, increasing productivity and wages. In fact, Chassamboulli and Peri (2014) consider a model with legal migration, unauthorized migration, and a native population and simulate reductions in the unauthorized population as a result of changing status to understand the implications for the wages of native workers. Combining their estimate for native wage growth

¹² Because CBO does not forecast wage growth for native workers and foreign-born workers separately, we assume that the rate of wage growth for native workers will be identical to that of all workers.

with CEA's estimate of the number of individuals affected by deferred action, we calculate an additional 0.08 percent, or \$40, increase in native workers' annual earnings by 2024.

References

- Barcellos, Silvia Helena. 2011. "Legalization and the Economic Status of Immigrants." RAND Corporation Working Paper.
- Borjas, George J. 2003. "The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *Quarterly Journal of Economics* 118(4): 1335-1374.
- Borjas, George, Richard B. Freeman, Lawrence F. Katz, John DiNardo, and John M. Abowd. 1997. "How Much Do Immigration and Trade Affect Labor Market Outcomes?" *Brookings Papers on Economic Activity* 1997(1): 1-90.
- Bratsberg, Bernt, James F. Ragan, and Zafar M. Nasir. 2002. "The Effect of Naturalization on Wage Growth: A Panel Study of Young Male Immigrants." *Journal of Labor Economics* 20(3): 568-597.
- Bureau of Labor Statistics (BLS). 2014. "Foreign-Born Workers: Labor Force Characteristics – 2013." BLS News Release, May 22, 2014.
http://www.bls.gov/news.release/archives/forbrn_05222014.pdf.
- Card, David. 1990. "The Impact of the Mariel Boatlift on the Miami Labor Market." *Industrial and Labor Relations Review* 43(2): 245-257.
- Census Bureau. 2012. "Methodology and Assumptions for the 2012 National Predictions." <http://www.census.gov/population/projections/files/methodology/methodstatement12.pdf>.
- Centers for Disease Control and Prevention (CDC). 2010. "Death Rate by 10-Year Age Groups: United States and Each State, 2007." http://www.cdc.gov/nchs/data/dvs/MortFinal2007_Worktable23r.pdf
- Chassamboulli, Andri and Giovanni Peri. 2014. "The Labor Market Effects of Reducing Undocumented Immigrants." NBER working paper. <http://www.nber.org/papers/w19932>.
- Congressional Budget Office (CBO). 2013a. "Cost Estimate: S. 744, Border Security, Economic Opportunity, and Immigration Modernization Act." June 18, 2013.
<https://www.cbo.gov/publication/44225>.
- Congressional Budget Office (CBO). 2013b. "The Economic Impact of S. 744, the Border Security, Economic Opportunity, and Immigration Modernization Act." June 18, 2013.
<https://www.cbo.gov/publication/44346>.
- Congressional Budget Office (CBO). 2014a. "The Budget and Economic Outlook: 2014 to 2024." February 4, 2014. <http://www.cbo.gov/publication/45010>.
- Congressional Budget Office (CBO). 2014b. "The 2014 Long-Term Budget Outlook." July 15, 2014. <http://www.cbo.gov/publication/45471>.
- Congressional Budget Office (CBO). 2014c. "An Update to the Budget and Economic Outlook: 2014 to 2024." August 27, 2014. <http://www.cbo.gov/publication/4563>.
- Finn, Michael G. 2012. "Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 2009." Oak Ridge Institute for Science and Education.
- Friedberg, Rachel M. 2001. "The Impact of Mass Migration on the Israeli Labor Market." *Quarterly Journal of Economics* 116(4): 1373-1408.
- Hunt, Jennifer. 1992. "The Impact of the 1962 Repatriates from Algeria on the French Labor Market." *Industrial and Labor Relations Review* 45(3): 556-572.

- Hunt, Jennifer and Marjolaine Gauthier-Loiselle. 2010. "How Much Does Immigration Boost Innovation?" *American Economic Journal: Macroeconomics* 2: 31-56.
- Kato, Takao and Chad Sparber. 2013. "Quotas and Quality: The Effect of H-1B Visa Restrictions on the Pool of Prospective Undergraduate Students from Abroad." *Review of Economics and Statistics* 95(1): 109-126.
- Kossoudji, Sherrie A. and Deborah A. Cobb-Clark. 2002. "Coming Out of the Shadows: Learning about legal Status and Wages from the Legalized Populaiton." *Journal of Labor Economics* 20(3): 598-628.
- Oakford, Patrick. 2014. "Administrative Action on Immigration Reform: The Fiscal Benefits of Temporary Work Permits." Center for American Progress, September 2014.
<http://cdn.americanprogress.org/wp-content/uploads/2014/09/OakfordAdminRelief.pdf>.
- Ottaviano, Gianmarco and Giovanni Peri. 2012. "Rethinking the Effects of Immigration on Wages." *Journal of the European Economic Associate* 10(1): 152-197.
- Pan, Ying. 2012. "The Impact of Legal Status on Immigrants' Earnings and Human Capital: Evidence from the IRCA 1986." *Journal of Labor Research* 33: 119-142.
- Peri, Giovanni, Kevin Shih, and Chad Sparber. 2014. "Foreign STEM Workers and Native Wages and Employment in U.S. Cities." NBER Working Paper 20093.
<http://www.nber.org/papers/w20093>.
- Peri, Giovanni and Chad Sparber. 2009. "Task Specialization, Immigration, and Wages." *American Economic Journal: Applied* 1(3): 135-169.
- Passel, Jeffrey. 2005. "Unauthorized Migrants: Numbers and Characteristics." Pew Hispanic Center, June 14, 2005. <http://www.pewhispanic.org/files/reports/46.pdf>.
- Social Security Administration (SSA). 2013. "National Average Wage Index." Retrieved November 14, 2014. <http://www.ssa.gov/OACT/COLA/AWI.html>.